

## Cornus mas in Europe: distribution, habitat, usage and threats

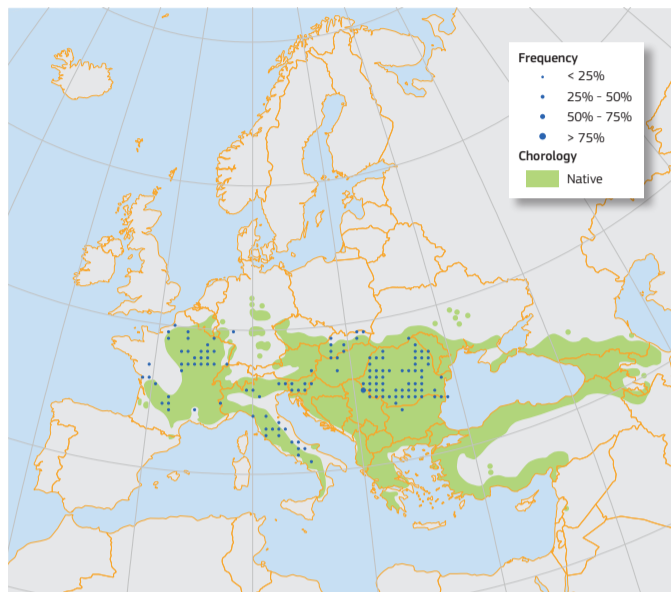
F. Da Ronch, G. Caudullo, T. Houston Durrant, D. de Rigo

*Cornus mas* L., commonly named as cornelian cherry, is a bushy shrub or small tree producing olive-shaped red fruits which are fleshy and edible. It is native of temperate zones, from central to southern Europe and eastwards to Asia Minor. It is light-demanding and occurs in warm and dry sites at forest edges and open areas as an element of sub-Mediterranean shrub vegetation communities. Its wood is very hardy and durable, prized for centuries for construction of weapons. It has been also cultivated, even outside its natural range, for its fruits, which have culinary and medical uses, and for ornamental purposes with a selection of several cultivars. This plant is apparently free of serious diseases, except in orchards. There is more attention focussed on the potential genetic erosion of natural populations, principally in those countries where cornelian cherry covers an important economic role.

Cornelian cherry (*Cornus mas* L.) is a deciduous shrub or small tree growing 2-6 m tall, exceptionally reaching 8-9 m. The crown is regular, bushy, hemispherical, and may expand more horizontally up to 5 m. The trunk is straight, sometimes with sinuous or multiple stems, the branches ends often drooping. The bark is grey-brownish, peeling off in scaly flakes like crocodile skin. The young shoots are hairy grey-greenish, becoming hairless later. The leaves are opposite with a short stalk, oval, 3-5 cm wide and 6-8 cm long, with an entire margin that is shortly acuminate and supplied with visible parallel veins. They turn to mahogany red in autumn. The flowers are small, 5-10 mm in diameter, **hermaphrodite**, with four yellow petals and on long peduncles, clustered in groups of 10-25 together in **umbels**. They bloom in late winter before the leaves sprout. The fruit is a fleshy, bright red cherry-like **drupe**, which ripens in mid-late summer. It is olive-shaped, 12-15 mm long, with a smooth and shiny rind, and containing two seeds. The fruit is edible when it falls and is dispersed by animals<sup>1-5</sup>.

### Distribution

Cornelian cherry is native of the temperate zones of Eurasia, with a **Pontic** and Mediterranean distribution. It occurs from central and southern Europe (Pyrenees, France, Italy and Balkan Peninsula) to Asia Minor (Turkey, Caucasus)<sup>6</sup>. However, it can also be commonly found all over Europe outside its natural range, as it has been exported for centuries first as a fruit and pharmaceutical plant, then as an ornamental shrub, and is now



Map 1: Plot distribution and simplified chorology map for *Cornus mas*. Frequency of *Cornus mas* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for *C. mas* is derived after Meusel and Jäger<sup>6</sup>.

naturalised in some countries<sup>4</sup>. Although its natural northern limits are Belgium and Germany, it has been planted in colder regions: e.g. in Oslo, Cornelian cherry trees in parks and gardens ripen every year<sup>7</sup>. It has also been exported to North America as

a landscape ornamental<sup>8,9</sup>, and to China as an ornamental tree and for medical uses<sup>10</sup>.

### Habitat and Ecology

Generally, cornelian cherry occurs in warm and dry sites, from sea level up to 1500 m in the Alps (Switzerland) and in the Caucasus<sup>1,5,6</sup>. It is a light-demanding and slow-growing species, which thrives in open areas or in semi-shade vegetation, such as forest hedges, steppe shrubs, and light woodlands. It prefers moist, alkaline soils rich in nutrients, although it is principally found in warm and dry conditions. The cornelian cherry has a high plasticity, growing in all kinds of soils, from light sandy to heavy clay, with a pH ranging from slightly acid to very alkaline. Wind and frost are also well tolerated, and it can survive up to -30°C, while it is sensitive to salt and marine exposures. It also a long-living tree, surviving up to 300 years<sup>3,11</sup>. Cornelian cherry is found in the **thermophilous** mixed deciduous broadleaved forests, dominated by oaks (*Quercus pubescens*, *Q. cerris*, *Q. frainetto*, *Q. ilex*), hornbeams (*Carpinus betulus*, *Carpinus orientalis*) and manna ash (*Fraxinus ornus*). It can also be found in combinations with other sub-Mediterranean shrubs; e.g. wayfarer (*Viburnum lantana*), wild privet (*Ligustrum vulgare*), common dogwood (*Cornus sanguinea*), common hawthorn (*Crataegus monogyna*), European barberry (*Berberis vulgaris*), etc.<sup>12</sup>.

### Importance and Usage

The wood of cornelian cherry has been valued over the centuries for its hardness, durability and flexibility. In ancient Greece, the wood of cornel was considered one of the most valuable precious woods, mentioned also in the writings by Homer. In the Virgil's Aeneid the cornelian is cited as wood used for the Trojan horse<sup>3</sup>. Ptolemy attested the use of this wood for the Macedonian cavalry spears. During the Roman period it was favoured to make the shafts of javelins. Pliny wrote that cornelian cherry wood was used for making "spokes of wheels, or else for making wedges for splitting wood, and pins or bolts, which have all the hardness of those of iron". Records of its use continued for centuries, prized for weapon construction, such as bows, darts, pikes, etc., and other tools. More recently this wood has been used for the manufacture of wheel spokes, ladder rungs, and tool handles<sup>2,4,13,14</sup>. The wood has reddish **sapwood** and dark brown **heartwood**, of a fine texture and difficult to split. Together with common box (*Buxus sempervirens*) and strawberry tree (*Arbutus unedo*), this species is among the toughest and most durable European woods with the highest specific gravity<sup>5,15</sup>. The fruits are edible and have a similar taste to sour cherries<sup>3</sup>. The cornelian cherry is a species of economic interest for fruit production<sup>16</sup>. Plants are cultivated in orchards in many countries of eastern Europe, Caucasus and central Asia, as its sweet-acid fruits are very valuable for fresh consumption and for processing to produce syrups, juices, jams and other traditional products<sup>17-21</sup>.



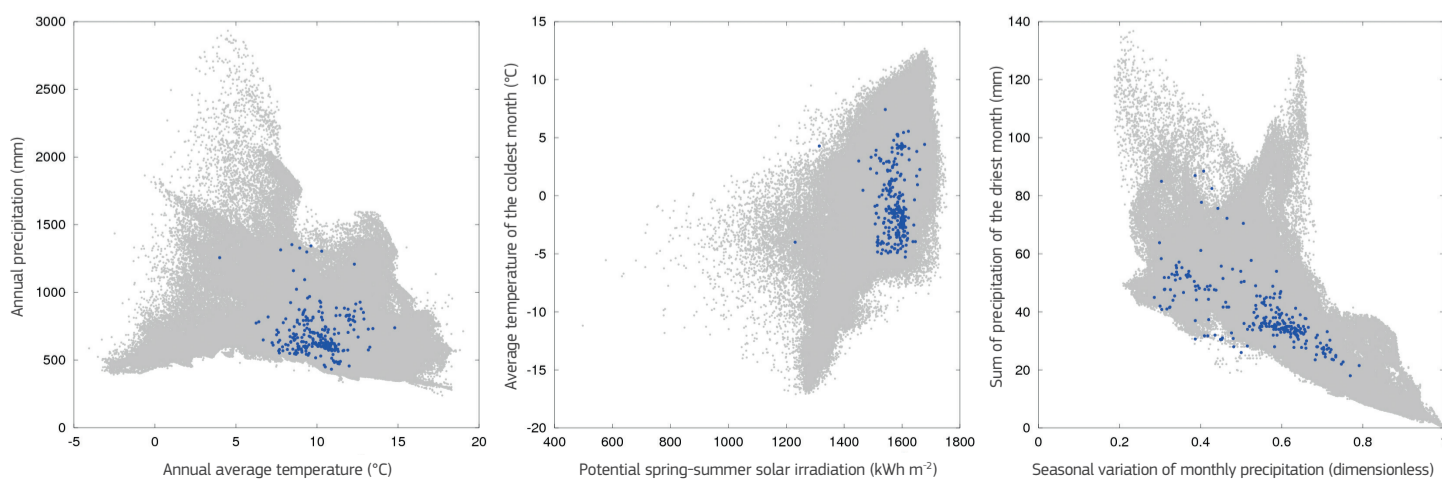
Bright red cherry-like fruits are produced in summer. (Copyright AnRo0002, commons.wikimedia.org; CC0)



Olive-shaped green drupes maturing in spring. (Copyright AnRo0002, commons.wikimedia.org; CC0)

Field data in Europe (including absences) ● Observed presences in Europe ●

Autoecology diagrams based on harmonised field observations from forest plots.



The fleshy fruits of Cornelian cherry are edible and used for a variety of culinary purposes. (Copyright Marion Schneider & Christoph Aistleitner, commons.wikimedia.org; PD)



Cluster of hermaphrodite flowers composed of 4 yellow stamens and petals and 4 greenish sepals. (Copyright AnRo0002, commons.wikimedia.org: CCO)

For this purpose several cultivars have been selected, bearing fruits with different sizes, taste (acidity and sweet) and colours (from creamy white, yellow, orange, red, violet to black); e.g. the 'Macrocarpa' variety bears large and pear-shaped fruits, 'Alba' white fruits and 'Flava' yellow and sweeter fruits<sup>4</sup>. In Asia, Cornelian cherries are also made into an alcoholic beverage, similar to the 'Drenja' beverage produced in Serbia<sup>22</sup>. Fruits are rich in tannins and sugars as well as phenols, ascorbic acid, flavonoids and anthocyanins<sup>23, 24</sup>. Traditionally the fruits were used as a diuretic, analgesic and tonic. In Middle Age cornelian cherry shrubs were commonly planted in monastery gardens<sup>4</sup>. Recently its therapeutic properties have been well documented, finding high antioxidant and anti-inflammatory properties with beneficial effects on cardiovascular, endocrine, gastrointestinal and immune systems<sup>22, 24, 25</sup>. The abundance of flowers

blossoming in late winter, its plasticity in growing in different kinds of soils and its trimming tolerance, make this species well adapted for use in gardens and parks as an ornamental, nectariferous, hedge and shade plant<sup>4, 5, 16</sup>. As for fruits, many cultivars are available in trade all over the world with several habits, colours of leaves and flowering abundance; e.g. 'Nana' plump and growing in dwarf stature, 'Elegantissima' with leaves with yellow or pink margins, 'Variegata' with white margins<sup>26</sup>.

### Threats and Diseases

The cornelian cherry has been apparently free of disease and pest problems, a highly appreciated characteristic which gained its use as an ornamental and orchard species. However, recently the first diseases have been reported, principally in nurseries and plantations, such as the leaf spot and fruit rot disease caused by

the fungus *Colletotrichum acutatum* observed in Iran<sup>27</sup>, or rots on young seedlings caused by the oomycete *Phytophthora citricola* in Bulgaria<sup>28</sup>. The widespread use of cultivars vegetatively propagated and the deforestation of natural populations are increasing the attention on threats of genetic erosion. Mainly in the countries where the cornelian cherry covers an important economic role, new genetic protection programmes have been created for germplasm conservation<sup>3, 17, 20, 29</sup>.



Oval leaves with entire margins and evident veins. (Copyright Franco Rossi, www.actaplantarum.org: AP)



Floral bud blossoming in early spring. (Copyright Franco Rossi, www.actaplantarum.org: AP)



Shrub form of Cornelian cherry with yellow flowers blossoming before foliage develops in spring. (Copyright Marinella Zepigi, www.actaplantarum.org: AP)

### References

- [1] S. Pignatti, *Flora d'Italia* (Edagricole, Bologna, 1982).
- [2] M. J. Saint-Hilare, *Treatise on Trees and Shrubs Grown in France and in the Countryside - Version translated by J B Fleishman* (Firmin Didot Press, Paris, 1825).
- [3] V. Dörken, *Jahrbuch des Bochumer Botanischen Vereins* **1**, 213 (2010).
- [4] L. Reich, *Arnoldia* **56**, 2 (1996).
- [5] B. K. Shishkin, et al., *Flora of the USSR - Volume XVII: Umbelliflorae (continued)*, vol. 17 of Flora of the USSR (Keter Press, Jerusalem, 1970).
- [6] H. Meusel, E. Jäger, eds., *Vergleichende Chorologie der Zentraleuropäischen Flora - Band I, II, III* (Gustav Fischer Verlag, Jena, 1998).
- [7] F. C. Schübel, *Die Pflanzenwelt Norwegens. Ein Beitrag zur Natur- und Culturgeschichte Nord-Europas* (Christiania, A.W. Brögger, 1975).
- [8] C. S. Sargent, *Manual of the Trees of North America (exclusive of Mexico)*, vol. 2 (Dover Publications, New York, 1961), second edn.
- [9] M. T. Mmbaga, E. C. Nnodu, *HortScience* **41**, 721 (2006).
- [10] J. Q. Xiang, D. E. Boufford, *Flora of China, Text Volume 14, Apiaceae through Ericaceae*, F. of China Editorial Committee, ed. (Missouri Botanical Garden Press, 2005), pp. 206-221.
- [11] P. Brindza, J. Brindza, D. Toth, S. V. Klimenko, O. Grigorieva, *Acta Horticulturae* **760**, 433 (2007).
- [12] U. Bohn, et al., *Karte der natürlichen Vegetation Europas; Map of the Natural Vegetation of Europe* (Landwirtschaftsverlag, 2000).
- [13] R. E. Weaver, *Arnoldia* **36**, 50 (1976).
- [14] M. M. Markle, *American Journal of Archaeology* **81**, 323 (1977).
- [15] I. Brémaud, et al., *Annals of Forest Science* **69**, 373 (2012).
- [16] J. H. Wierssema, B. León, *World Economic Plants: A Standard Reference* (CRC Press, 2013).
- [17] S. Ercsly, *Journal of Fruit and Ornamental Plant Research* **12**, 87 (2004).
- [18] N. Mamedov, L. E. Craker, *Acta Horticulturae* **629**, 83 (2004).
- [19] P. Brindza, J. Brindza, D. Tóth, S. V. Klimenko, O. Grigorieva, *Acta Horticulturae* **818**, 85 (2009).
- [20] O. Rop, J. Mlcek, D. Kramarova, T. Jurikova, *African Journal of Biotechnology* **9**, 1205 (2010).
- [21] H. Hassanpour, Y. Hamidoghli, H. Samizadeh, *Biochemical Systematics and Ecology* **48**, 257 (2013).
- [22] B. J. West, S. Deng, C. J. Jensen, A. K. Palu, L. F. Berrio, *International Journal of Food Science & Technology* **47**, 1392 (2012).
- [23] E. Mratinić, M. F. Akšić, V. Rakonjac, R. Miletić, M. Žikić, *Plant Systematics and Evolution* **301**, 365 (2015).
- [24] P. Mikaili, et al., *Journal of pharmaceutical and biomedical sciences* **35**, 1732 (2013).
- [25] N. Ersoy, Y. Bagci, V. Gok, *Scientific Research and Essays* **6**, 98 (2011).
- [26] A. McIndoe, *The Horticulture Gardener's Guides - Shrubs* (David & Charles, Devon, UK, 2005).
- [27] M. Arzanlou, M. Torbati, *Archives Of Phytopathology And Plant Protection* **46**, 518 (2013).
- [28] S. G. Bobev, K. Van Poucke, M. Maes, *Plant Disease* **93**, 551 (2009).
- [29] S. Klimenko, *Journal of Fruit and Ornamental Plant Research* **12**, 93 (2004).

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